

## **REMARKS**

### **INTRODUCTION**

Claims 1-12 are pending in the application, with claims 8, 10 and 12 withdrawn from consideration. Examiner's acknowledgment of Applicant's election of claims 1-7, 9 and 11 in response to an earlier restriction requirement is noted and appreciated.

By this Amendment, claims 1, 7, 11 and 12 have been amended, and new claim 13 has been added. No new matter has been introduced which requires further consideration or search. In view of the foregoing amendments and following remarks, it is respectfully submitted that the application is in condition for allowance. Reconsideration is respectfully requested.

### **OBJECTION TO THE SPECIFICATION**

The specification has been objected to due to certain informalities. In response, a substitute specification has been submitted therewith.

### **CLAIM OBJECTIONS**

Objections to claims 1, 7 and 11 due to certain informalities have been addressed by amendments thereto.

### **CLAIM REJECTIONS UNDER 35 U.S.C. § 103**

On pages 3-7 of the Office Action, claims 1-5, 7, 9 and 11 are rejected under 35 U.S.C. §103(a) as being unpatentable over Henry et al. (cited publication, hereinafter "*Henry*") in view of Klank et al. (cited publication, hereinafter "*Klank*") and Fulcrand et al. (US Patent No. 6,319,674, hereinafter "*Fulcrand*"). On page 7 of the Office Action, claim 6 is rejected under 35 U.S.C.

§103(a) as being unpatentable over *Henry*, *Klank*, *Fulcrand*, and further in view of *McMurry* (cited publication, hereinafter “*McMurry*”).

The Examiner asserted that *Henry* “teaches reaction of a silane compound with amino-functionalized surfaces to adhere the silane compound to a substrate (5332, Schemes 1 and 2)” (see item 8). However, it is respectfully submitted that schemes 1 and 2 as disclosed in *Henry* do not have such asserted feature. Specifically, silane is mentioned in *Henry* for use of glass (not PMMA) as substrate (see *Henry* at page 5331, left column, from second last line, which states that “one of the major advantages to using glass substrates for microdevices is their ease of fabrication as well as the ease of chemical modification of glass surfaces using organosilanes”).

Moreover, in *Henry*, the  $\text{-NH}_2$  (amino group) is generated on the PMMA surface. By contrast, the  $\text{-OH}$  (hydroxyl group) in the present application is generated on the PMMA surface. Indeed, none of the cited references of *Henry*, *Klank* and *Fulcrand* teaches or suggests the claimed feature of generating the  $\text{-OH}$  on the PMMA surface.

In item 12 of the Office Action, the Examiner asserted that the “physical surface modification comprises thermal annealing treatment Klank 242 paragraph 6-243 paragraph 4, discussing the melting of the material in the trench and the heating of the trench walls, which constitutes localized thermal annealing”). However, the thermal treatment in *Klank* is used to form a trench, rather than to modify the surface of the trench as set forth in the claims. In *Klank*, after the thermal treatment, large bulges are formed in the trench (see Fig. 5 and description in *Klank*, e.g., from line 8 of right column, which states that the PMMA channel contains “resolidified material at the channel side wall...condensed polymer forms small droplets with diameters in the order of  $15\mu\text{m}$ ”). Accordingly, *Klank* clearly fails to teach the claimed method of producing smooth surfaces in the channel after the trench formation.

As to claim 6, the Examiner asserted in item 16 of the Office Action that *McMurry* “teaches that lithium aluminum hydride is known to reduce ester compounds to primary alcohols, yielding

hydroxyl functional groups (pp 639-640).” However, the organic reactions described in *McMurry* took place only in the homogeneous liquid phase. In the present application as set forth in the pending claims, the described reaction took place in a solid surface. It is well-known that reactions occurring on the solid surface are very different from that occurring in homogeneous liquid phase. For example, the DNA-DNA hybridization in solution has been known for decades before the DNA microarray was invented in 1995. In the latter case the DNA hybridization occurs between the liquid/solid interface. Therefore, even if *McMurry* relates to small molecule esters that can be modified to a hydroxyl group, it does not teach or suggest the solid surface reactions of PMMA with LAH.

New claim 13 has been added to further set forth the anneal temperature, which is different from the thermal treatment temperature as taught by *Klank*. In *Klank*, the thermal treatment of the PMMA is below the glass temperature of PMMA (see line 12, left column of page 245, which states that since “the glass temperature of PMMA is about 105 degrees C, we chose an annealing temperature of 80 degrees C”). On the other hand, the annealing temperature in the present application can exceed above the glass temperature of PMMA (see page 7, from line 19 which states that the “annealing is performed in ambient air with elevated temperature at 170 degrees C for 30 minutes...temperature is intentionally chosen, so that the rugged surface produced in forming the trench/channel is smoothened to obtain the smoothness of 2 nm”, and from line 14, page 8 of the specification, which states that the “roughness of the non-annealed surface is about 5-10 um and decreases to 2.04+-0.61nm (rms) after the thermal annealing”).

In view of the above amendment, Applicant believes the pending application is in condition for allowance.

Respectfully submitted,



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